

## PRECURSOR DESCRIPTION SHEET

LER No.: 272/84-017  
Event Description: Unavailability of High-Head Charging Pumps  
Date of Event: July 16, 1984  
Plant: Salem 1

### EVENT DESCRIPTION

#### Sequence

While performing surveillance testing of charging pump 12, the pump seized after running for ~30 s. Charging pump 12 was declared inoperable; the redundant charging pumps remained operable. Upon disassembly of the pump, a small amount of resin particles and metal filings were discovered in the pump casing. As a result of these findings, an investigation ensued to determine the source and extent of the problem. Similar material was found in the common suction line of all charging pumps.

It has been assumed (because of the extremely close internal tolerances in the centrifugal charging pumps) that the other charging pumps would also have failed as a result of the metal filings.

#### Corrective Action

Replaced rotating element in the charging pump. Suction lines were cleaned and temporary strainers installed.

#### Plant/Event Data

Systems Involved:  
HHIS

Components and Failure Modes Involved:  
Charging pump 12 — failed on demand  
Remaining charging pumps — potentially failed on demand

Component Unavailability Duration: 360 h (postulated)  
Plant Operating Mode: 6 (0% power)  
Discovery Method: During testing  
Reactor Age: 3.9 years  
Plant Type: PWR

#### Comments

This unavailability possibly could have been discovered during startup checks; however, it is being conservatively modeled as if it could have rendered HPI unavailable at power.

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MODELING CONSIDERATIONS AND DECISIONS

Initiators Modeled and Initiator Nonrecovery Estimate

Postulated tran-      Base case  
sient, LOOP,  
and LOCA

Branches Impacted and Branch Nonrecovery Estimate

HPI	1.0	No recovery is assumed possible
Bleed and feed	1.0	No recovery is assumed possible

Plant Models Utilized

PWR plant Class B

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CONDITIONAL CORE DAMAGE PROBABILITY CALCULATIONS

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UNAVAILABILITY, DURATION= 360

NON-RECOVERABLE INITIATING EVENT PROBABILITIES

TRANS	3.7E-01
LOOP	2.8E-03
LOCA	5.1E-04

SEQUENCE CONDITIONAL PROBABILITY SUMS

End State/Initiator	Probability
CV	
TRANS	1.6E-03
LOOP	6.2E-07
LOCA	4.8E-04
Total	2.1E-03
CD	
TRANS	2.0E-06
LOOP	7.0E-07
LOCA	4.5E-06
Total	7.3E-06
ATWS	
TRANS	0.0E+00
LOOP	0.0E+00
LOCA	0.0E+00
Total	0.0E+00

DOMINANT SEQUENCES

End State: CV                      Conditional Probability: 1.5E-03

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109 TRANS -RT -AFW -PORV.OR.SRV.CHALL SS.RELEAS.TERM HPI

End State: CD Conditional Probability: 1.8E-05

307 LOCA -RT -AFW HPI SS.DEPRESS

SEQUENCE CONDITIONAL PROBABILITIES

Sequence	End State	Prob	N Rec**
101 TRANS -RT -AFW PORV.OR.SRV.CHALL -PORV.OR.SRV.RESEAT SS.RELEAS.TERM HPI	CV	6.3E-05	3.4E-01
109 TRANS -RT -AFW -PORV.OR.SRV.CHALL SS.RELEAS.TERM HPI	CV	1.5E-03 *	3.4E-01
126 TRANS -RT AFW MFW HPI(F/B) -SS.DEPRESS COND/MFW	CD	1.8E-06	3.1E-02
214 LOOP -RT/LOOP -EMERG.POWER AFW HPI(F/B)	CD	7.3E-07	9.2E-02
304 LOCA -RT -AFW HPI -SS.DEPRESS -LPI/HPI -LPR/HPI	CV	4.9E-04	3.4E-01
307 LOCA -RT -AFW HPI SS.DEPRESS	CD	1.8E-05 *	3.4E-01

\* dominant sequence for end state  
\*\* non-recovery credit for edited case

Note: For unavailabilities, conditional probability values are differential values which reflect the added risk due to failures associated with an event. Parenthetical values indicate a reduction in risk compared to a similar period without the existing failures.

MODEL: b:\pwrmtree.cmp  
DATA: b:\salemp.cmp

No Recovery Limit

BRANCH FREQUENCIES/PROBABILITIES

Branch	System	Non-Recov	Opr Fail
TRANS	1.0E-03	1.0E+00	
LOOP	2.3E-05	3.4E-01	
LOCA	4.2E-06	3.4E-01	
RT	2.5E-04	1.2E-01	
RT/LOOP	0.0E+00	1.0E+00	
EMERG.POWER	5.4E-04	5.1E-01	
AFW	1.0E-03	2.7E-01	
AFW/EMERG.POWER	5.0E-02	3.4E-01	
MFW	2.0E-01	3.4E-01	
PORV.OR.SRV.CHALL	4.0E-02	1.0E+00	
PORV.OR.SRV.RESEAT	2.0E-02	5.0E-02	
PORV.OR.SRV.RESEAT/EMERG.POWER	2.0E-02	5.0E-02	
SS.RELEAS.TERM	1.5E-02	3.4E-01	
SS.RELEAS.TERM/-MFW	1.5E-02	3.4E-01	
HPI	1.0E-03 > 1.0E+00	5.2E-01 > 1.0E+00	

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Branch Model: 1.OF.2			
Train 1 Cond Prob:	1.0E-02	> Failed	
Train 2 Cond Prob:	1.0E-01	> Failed	
HPI(F/B)	1.0E-03	> 1.0E+00	5.2E-01 > 1.0E+00      4.0E-02
Branch Model: 1.OF.2+opr			
Train 1 Cond Prob:	1.0E-02	> Failed	
Train 2 Cond Prob:	1.0E-01	> Failed	
HPR/-HPI	3.0E-03		5.6E-01      4.0E-02
PORV.OPEN	1.0E-02		1.0E+00
SS.DEPRESS	3.6E-02		1.0E+00
COND/MFW	1.0E+00		3.4E-01
LPI/HPI	1.0E-03		3.4E-01
LPR/-HPI.HPR	6.7E-01		1.0E+00
LPR/HPI	1.0E-03		1.0E+00

\*\*\* forced

Minarick  
04-11-1987  
14:26:35